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ABSTRACT

To determine whether college students trained in the independent study strategy PORPE ("Predict, Organize, Rehearse, Practice, Evaluate"), could perform as well as other students trained to create and rehearse their own textually explicit and implicit test questions, a study compared performances on immediate and delayed multiple choice and essay exams, both dichotomously and holistically scored. Subjects were 48 college freshmen enrolled in developmental reading/study strategy courses at two state universities. Results indicated that PORPE appears to offer content area instructors a comprehensive strategy which can help their students prepare for multiple choice and essay exams, a strategy which holds considerable promise for high risk students. These results generally corroborate those of the first study in demonstrating that PORPE is a comprehensive study strategy system which can facilitate student learning of psychology concepts, regardless of whether they are presented in recognition or recall formats. (One figure is included and 5 tables of data and 24 references are attached, as well as a master list of college reading and learning assistance technical reports.) (SR)

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College Reading and Learning Assistance
Technical Report No. 89-01

A COMPREHENSIVE STUDY STRATEGY USING STUDENT WRITING AS A MEANS OF LEARNING CONTENT AREA CONCEPTS: STUDY II

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A COMPREHENSIVE STUDY STATEGY USING STUDENT WRITING AS A MEANS OF LEARNING CONTENT AREA CONCEPTS: STUDY II

While experts continue to extol the integrated use of reading and writing as potent vehicles of learning, little evidence exists to show that students can independently use writing as a means of successfully mastering content area concepts (Langer, 1986; Langer & Applebee, 1987; Newell, 1984). The research that does exist focuses on three closely related approaches--summarization, analytical essays, and PORPE (Simpson, 1986). Researchers have amassed considerable evidence for using summarization as a means of remembering content area material when students have received training (Carr, Dewitz, Ogle, & Morningstar, 1987; Doctorow, Wittrock & Mark, 1978; Kings, Bigg, & Lipsky, 1984; Linden & Wittrock, 1981). Although this line of research seems initially encouraging, three concerns need to be acknowledged. First of all, many studies have not been able to demonstrate decidedly that students trained in summarization will be able to score higher on objective exams than students employing alternative strategies (King et al, 1984; Linden & Wittrock, 1981). A second concern is that the task of writing a summary has always been defined by the researcher rather than the learner. Hidi and Anderson (1986) classify these summaries as reader-based. In contrast, writer-based summaries are those that students produce for themselves, with no constraints on style, space, or structure, in order to facilitate and monitor their understanding and learning. A third concern has to do with an

overriding emphasis on easily and quickly quantified measures of content (e.g., number of idea units) to the exclusion of qualiltative measures that attempt to explain how a writer combines, synthesizes, and arranges separate pieces of information into a meaningful, whole discourse.

Two other studies have investigated the analytical essay's impact on student learning (Langer, 1984; Newell, 1984). Even though Langer's and Newell's research does address some of the limitations of the summarization studies, the effects of training students how to write the analytical essay are still unknown. A more serious limitation to the analytical essay studies and to the summarization studies is that they do not seem to offer students the cognitive and metacognitive processes necessary to guide them through the processes of reading, studying, writing, and learning.

A third line of research investigating the use of writing as a means of learning content has centered on PORPE (Predict, Organize, Rehearse, Practice, Evaluate). PORPE is an independent study strategy which operationalizes the encoding and metacognitive processes that effective students engage in to understand and subsequently learn content area material (Simpson, 1986). The steps, theoretical rationale, and research basis for PORPE are summarized in Figure 1. As students independently employ the synergistic steps of PORPE they create learner-oriented essays which help them prepare for content examinations. Unlike previous summarization studies, students trained in PORPE have been able to significantly outperform a

similar control group on an immediate and delayed multiple choice exam over a psychology chapter excerpt (Simpson, Hayes, Stahl, Conner & Weaver, 1988). Moreover, the essay answers (immediate and delayed) of the PORPE students were judged to be significantly superior when holistically scored for content, cohesion, and coherence. In this first study, however, the students trained in PORPE were compared to students trained in answering and rehearsing teacher-predicted questions. Yet to be answered, however, is the question of whether or not PORPE would be as effective as another non-writing strategy more equivalent in the cognitive and metacognitive processes essential to independent learning.

Insert Figure 1 about here

Thus, this second study sought to determine whether college students trained in PORPE could perform as well as other students trained to create and rehearse their own textually explict and implicit test questions. Specifically, the research questions investigated were:

1) Will students trained in PORPE perform significantly better on the combined multiple choice and essay exam (immediate and delayed)?

2) Will students trained in PORPE perform significantly better on the immediate and delayed multiple choice exam?

3) Will students trained in PORPE perform significantly better on the immediate and delayed essay exam dichotomously scored?

4) Will students trained in PORPE perform significantly better on the immediate and delayed essay exam holistically scored?

METHOD

Subjects

The subjects were 48 college freshmen enrolled in developmental reading/study strategy courses at two state supported universities. The students were admitted to and enrolled in the respective universities through the developmental studies program because their Scholastic Aptitude Test scores and/or high school grade point averages were below basic criteria for regular admission to either university. They were not enrolled in any regular core college courses, but instead took only the required developmental reading, writing, and math courses. Two intact classes from each of the two universities were randomly assigned to each treatment condition, for a total of two experimental and two control groups. To insure similarity across the four groups and across the two universities, the subjects' scores on the Basic Skills Exam, a state mandated reading test required of all entering college students, were collected and used as a covariate in the data analyses.

Procedures

For three weeks, the study involved five different phases which were integrated into the normal classroom routine. In phase one the students in both groups were assigned to read three different psychology textbook excerpts, the third one being the criterion passage for the data collection. All three excerpts were written on the college level and were between 1,658 and 3,844 words long. During the second phase, training, the principal researcher taught the subjects either how to apply PORPE or how to generate and answer textually explicit and implicit short answer questions. In phase three, independent study, the psychology chapter excerpts were taken from the subjects who were then given two days to study their self-developed training materials. During phase four, testing, the subjects were allowed 50 minutes to first answer the essay questions and then the multiple choice questions, both of which counted in their course grades. A delayed and unannounced testing, phase five, occurred exactly two weeks later for the criterion passage.

Data Source and Scoring Procedures

The criterion exam contained 20 multiple choice items and two essay questions, each worth 10 points, making a total of 40 possible points. All three exams contained approximately 60% memory level questions and 40% higher level questions (either interpretative or applicative). Piloted with similar students, the Kuder Richardson Formula 20 provided a reliability

coefficient of .79 for the criterion exam. Each exam also contained two essay questions which asked the students to discuss, compare, and contrast.

The multiple choice exam was scored per question as having either a correct or incorrect response. The essays were independently and blindly scored by two raters in two different ways. The first scoring was done by two raters who used a dichotomous scale (Cooper & Odell, 1977) with an interrater reliability of .87. This scoring procedure was meant to correspond to the procedure that a content area teacher generally employs when grading essay exams.

The second scoring was a holistic assessment (Cooper, 1977) of three features for each essay: content, organization, and cohesion. Each feature was scored on a 4-point scale, with 4 being the highest score. A rating of 0, however, was given on content if an essay failed to respond to the assignment: the scoring then ended for that essay with organization and cohesion also receiving a 0 rating. A rating of 0 was also given on organization and cohesion if any essay merely listed information in phrases or unrelated, non-paragraphed sentences. The subjects received a subscore on each of the three features and a total holistic score, which was the sum of the subscores. Scores for each feature and a total holistic score were then summed (Myers, 1980) across the two independent raters' scores to produce a scale ranging from 0 to 8 for each feature, from 0 to 24 for an essay's total holistic score, and from 0 to 48 for both essays.

A Pearson Product Moment correlation revealed an interrater reliability of .93 for the overall holistic scoring.

RESULTS

The analysis of covariance revealed no significant differences on the Basic Skills Exam across the four intact classes, $F(2,46)= 1.14$, $p=.160$. Each of the four research questions is discussed below, and adjusted means are available in Tables 1 through 5.

1) There were significant treatment effects for PORPE on the combined multiple choice and essay portions of the exam on the immediate [$F(2,46)=17.67$ $p=.0001$] and delayed [$F(2,46)=28.93$, $p=.0001$] testings.

2) While there was no significant treatment effect for PORPE on the initial multiple choice test [$F(2,46)=2.22$, $p= .143$], there was a significant treatment effect on the delayed multiple choice test [$F(2,46)= 12.98$, $p=.001$].

3) There was a significant treatment effect for PORPE on the immediate [$F(2,46)=27.55$, $p=.0001$] and delayed [$F(2,46)=26.60$, $p=.0001$] dichotomously scored essays.

4) There were significant treatment effects for PORPE on the immediate [$F(2,46)=9.10$, $p=.004$] and delayed [$F(2,46)=17.06$, $p=.0001$] essays scored holistically. Broken down for each of the three holistically scored features/traits, the results were as follows:

CONTENT: There were significant treatment effects on the content subscore for the immediate [$F(2, 46)= 10.613$,

p= .002] and delayed [F(2, 46)= 21.353, p=.0001] PORPE essays.

ORGANIZATION: There were significant treatment effects on the organization subscore for the immediate [F(2,46)=13.174, p= .0001] and delayed [F(2,46)= 14.269, p= .0001] PORPE essays.

COHESION: There were significant treatment effects on the cohesion subscore for the immediate [F(2,46)= 3.349, p= .07] and delayed [F(2,46)= 13.988, p= .0001] PORPE essays.

DISCUSSION

The results of this second study generally corroborate the findings of our first study in demonstrating that PORPE is a comprehensive study strategy system which can facilitate student learning of psychology concepts, regardless of whether it be measured in recognition or recall formats. The single significant difference in findings between the two studies is that in this second study, the PORPE subjects did not score significantly higher on the initial multiple choice test. However, the potency and durability of PORPE were clearly demonstrated two weeks later on the delayed multiple choice test and even more clearly in the higher scores of the PORPE subjects on both the initial and delayed essay exams.

One plausible explanation for the lack of treatment effect between groups on the initial multiple choice test has to do with directed focus of attention and short-term memory. Because the control subjects were taught how to construct study questions on the key ideas in the chapter excerpts, their attention was narrowly focused on the specific major points and supportive details that their self-generated study questions emphasized as being important. This kind of attentive studying is useful in "cramming" for exams because it focuses the learner's attention on a finite amount of information to be remembered, at least for the short term.

However, this narrowly focused approach of generating textually explicit and implicit short answer questions seems not be be as useful in preparing students for essay exams, which demand that students not only remember facts and major ideas, but also be able to articulate meaningful relationships among them. This micro-level study strategy, with its emphasis on separate details or discrete chunks of information, seems not to encourage the learner to construct a coherent overview of the content (Langer, 1986). Moreover, without an overworking and coherent schematic network of information to rely upon, the learner seems to lose the ability to recall information accurately and fully as time goes by. This loss of recognition and recall abilility may very well explain the lower scores of the control subjects on the delayed multiple choice test and on both essay tests. In other words, the learner-oriented essays that the PORPE subjects predicted, produced, and then evaluated may have required more

elaborative processing and thus, greater depth of processing (Bradshaw & Anderson, 1982). The answering of the self-predicted short-answer questions, while initially a viable micro-level strategy, seems to lack the elaborative processing and the integrative support system necessary for higher levels of thinking that extended writing can provide learners (Coe, 1987; Langer, 1986).

The scores on the holistic analyses of organization and cohesion may offer some related clues to help explain why the PORPE subjects scored significantly higher than the control subjects on both the initial and delayed essay exams and on the delayed multiple choice exam. For instance, studies on writing quality have found that higher rated essays are also judged to be more coherent (Bamberg, 1983; Fahnestock, 1983; Witte & Faigley, 1981). To give just one of many examples, Stotsky (1986) concluded that the "number and variety of interconnections among the semantic units" of a student's essay contribute to the essay's clarity and overall quality. Moreover, she states that growth in the ability to create such meaningful and coherent texture reflects a commensurate growth in students' abilities to write about ideas. The essay exams that the control and the PORPE subjects were asked to compose essentially measured their ability to understand, remember, and write about ideas. The superior scores of the PORPE subjects on content, organization, and cohesion strongly suggest that the steps of PORPE led subjects to create more meaningful interconnections among ideas; certainly, they were better able to express meaningful

connections among ideas in their essay exams than were the control subjects. And it seems highly probably that those interconnections allowed the subjects to remember the information longer and more accurately than the control subjects. In short, the PORPE subjects' superior scores on organization and cohesion support the claim that PORPE can contribute to deeper and more elaborative processing of content ideas.

Finally, the results of this second study are similar to those reported by Marshall (1987) in a study investigating the roles that restrictive writing tasks (involving either no writing or written answers to short-answer questions) and extensive writing tasks (involving either personal analytic essays or formal analytic essays) play in secondary students' understanding of short stories. On both initial and delayed written posttests, students who had initially responded to the short stories in extended writing scored significantly higher on measures of descriptive elaboration, interpretation, and generalization than did students who had initially responded to the stories in restrictive writing. The scores on the delayed posttests point even more strongly to the power of extended writing to improve the abilities of students to recall and interpret stories they had read days or weeks earlier. While Marshall's study involved students' understanding of literary narrative, his findings are very similar to this study with expository text in that the PORPE trained subjects also demonstrated in their essays a superiority in learning over time.

IMPLICATIONS AND CONCLUSIONS

PORPE appears to offer content area instructors a comprehensive strategy which can help their students prepare for multiple choice and essay exams. This strategy can be initially introduced and taught by the instructor, but then gradually phased over to the students for their own control. Most importantly, PORPE is a strategy which holds considerable promise for high risk students, the subjects of this research study. If we listen to theorists and practitioners such as Berthoff (1981), Dowst (1980), Elbow (1981), and Fulwiler (1987), we learn the importance that writing plays in the creation of thought. But we must also remember than many high risk students have neither learned to appreciate the written word nor learned how to use langauge to construct or shape reality. PORPE provides an easily accessible set of integrated steps that can lead them to do so, for PORPE also teaches some of the equally necessary intellectual processes that accompany the higher use of language--i.e., the related principles of focusing, selecting, organizing, composing, monitoring, and revising thought. In short, PORPE seems to operationalize the cognitive and metacognitive processes that many high risk students need in order to succeed in college (Weinstein & Rogers, 1984).

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Table 1

Adjusted Group Means and Standard Deviations for the Combined Scores in the Multiple Choice and Dichotomously Scored Essays (Initial and Delayed)

Treatment	M	SD
PORPE		
initial testing[a]	25.25	4.43
delayed testing[a]	18.42	2.97
Questions-Answer		
initial testing[a]	19.67	4.40
delayed testing[a]	13.21	2.56

[a]Maximum possible score = 40

Table 2

Adjusted Group Means and Standard Deviations for the Multiple Choice Test (Initial and Delayed)

Treatment	M	SD
PORPE		
initial testing[a]	14.63	2.10
delayed testing[a]	13.46	2.01
Questions-Answer		
initial testing[a]	13.79	3.26
delayed testing[a]	11.38	2.14

[a]Maximum possible score = 20

Table 3

Adjusted Group Means and Standard Deviations for the Dichotomously Scored Essay Test (Initial and Delayed)

Treatment	M	SD
PORPE		
initial testing[a]	10.63	2.2
delayed testing[a]	4.96	1.1
Questions-Answer		
initial testing[a]	5.88	3.62
delayed testing[a]	1.83	.56

[a]Maximum possible score = 20

Table 4

Adjusted Group Means and Standard Deviations for Holistic Scoring of Initial Essays

	Holistic Criteria			
	Total	Content	Organization	Cohesion
Treatment	M (SD)	M (SD)	M (SD)	M (SD)
PORPE	29.29(2.12)[a]	9.54(.72)[b]	10.17(.69)[b]	10.00(.79)[b]
Question-Answer	23.04(2.34)[a]	6.54(.68)[b]	7.50(.76)[b]	9.00(.95)[b]

[a]Maximum possible score = 48

[b]Maximum possible score = 16

Table 5

Adjusted Group Means and Standard Deviations for Holistic Scoring of Delayed Essays

	Holistic Criteria			
	Total	Content	Organization	Cohesion
Treatment	M (SD)	M (SD)	M (SD)	M (SD)
PORPE	16.33(2.14)[a]	5.00(.57)[b]	5.54(.77)[b]	5.83(.93)[b]
Questions-Answer	6.25(1.98)[a]	1.58(.57)[b]	2.25(.93)[b]	2.42(.99)[b]

[a]Maximum possible score = 48

[b]Maximum possible score = 16

FIGURE 1. Steps, theoretical constructs, and research basis for PORPE

TACTICS	TACTICAL ACTION	THEORETICAL CONSTRUCT	RESEARCH BASIS
PREDICT	Predict possible essay questions on the material to clarify purposes for subsequent study, identify critical aspects of text, and focus on major content.	Encoding process of selection Processing text in an elaborative manner Planning aspect of writing	Cook & Mayer (1983) Reder (1980), Rickards & Divesta (1974) Tierney & Pearson (1983)
ORGANIZE	Organize key ideas pertinent to the self-predicted essay question using one's own words, structure, and methods. Summarize and synthesize ideas via maps, charts, outlines.	Encoding processes of selection, acquisition, and construction Planning and organizing ideas for later writing	Cook & Mayer (1983), Weinstein & Mayer (1986) Tierney & Pearson (1983)
REHEARSE	Rehearse the organizational structure and key ideas via active self-recitation.	Monitoring, self-questioning, and taking corrective action Rehearsing promotes learning	Baker & Brown (1984) Anderson (1978), Gagne (1978), Smith (1967)
PRACTICE	Practice by writing an essay answer to the self-predicted question from recall.	Encoding processes of integration Writing facilitates higher levels of thinking Writing requires a necessary form to demonstrate understanding Writing is a generative process	Cook & Mayer (1983) Emig (1977), Langer (1986), Newell (1984) Coe (1987), Richards (1936) Berthoff (1981), Stotsky (1986)
EVALUATE	Evaluate with a checklist the completeness, accuracy, and appropriateness of the essay. A positive evaluation indicates a readiness for the test. A negative evaluation indicates a need to loop back into the previous steps of PORPE.	Self-regulating process of monitoring, checking, and evaluating Writing as feedback and reinforcement to the learner	Baker & Brown (1984) Emig (1977), Langer (1986)

Master List
College Reading and Learning Assistance Technical Reports

Technical Report No.	
84-01	Brozo, W.B., Schmelzer, R.V., & Spires, N.A. A Study of Test Wiseness Clues in College/University Teacher-Made Tests with Implications for Academic Assistance Centers. (ERIC No. ED 240-928)
84-02	Stahl, N.A., Brozo, W.G., & Henk, W.A. Evaluative Criteria for College Reading-Study Research. (ERIC No. ED 240-933)
84-03	Schmelzer, R.V., Brozo, W.G., & Stahl, N.A. Using a Learning Model to Integrate Study Skills into a Peer-Tutoring Program. (ERIC No. ED 256-244)
84-04	Brozo, W.G. & Stahl, N.A. Focusing on standards: A Checklist for Rating Competencies of College Reading Specialists. (ERIC No. ED 248-762)
84-05	Stahl, N.A., Brozo, W.G., & Gordon, B. The Professional Preparation of College Reading and Study Skills Specialists. (ERIC No. ED 248-761)
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84-08	Brozo, W.G. & Schmelzer, R.V. Faculty Perceptions of Student Behaviors: A Comparison of Two Universities. (Not Submitted to ERIC--See the Journal of College Student Personnel, Vol. 26, #3)
84-09	Henk, W.A., Stahl, N.A., & King, J.R. The Readability of State Drivers' Manual. (Not submitted to ERIC--please refer to Transportation Quarterly, 38(4), 507-520).
84-10	Stahl, N.A., Henk, W.A., & King, J.R. Are Drivers' Manuals Right for Reluctant Readers? (ERIC No. ED 245-208)
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